DISTRIBUTION AND SEASONAL MOVEMENTS OF SAGINAW BAY FISHES

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DISTRIBUTION AND SEASONAL MOVEMENTS OF SAGINAW BAY FISHES

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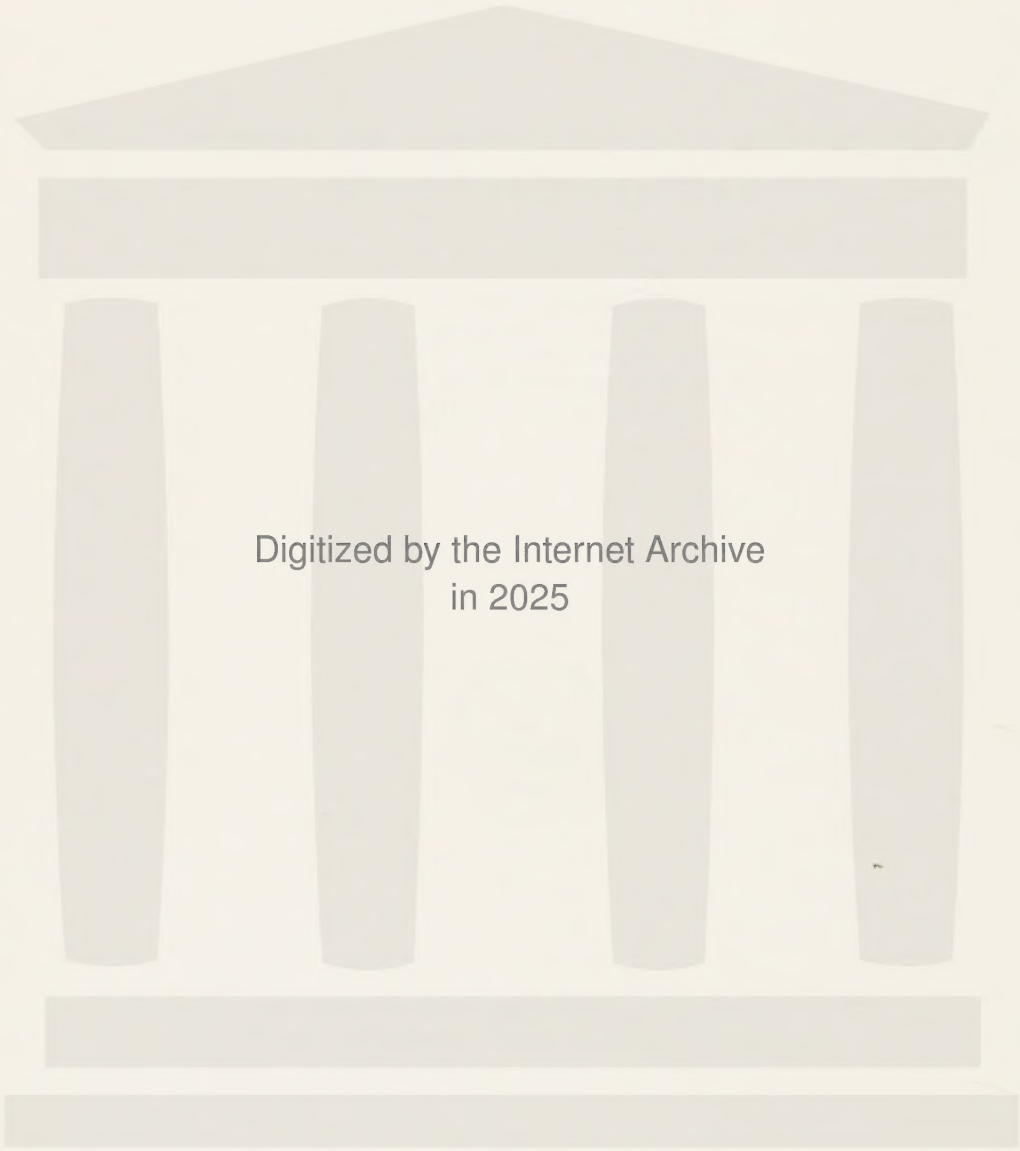
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ABSTRACT

The fish collected by the Bureau of Commercial Fisheries' M/V Cisco from Saginaw Bay in 1956 yielded no new species records but provided many new locality records within the Bay. The collections included representatives of 47 species; 74 species are known to occur in the Bay.

Records from trawling in June-October provided information on seasonal distribution and movements of alewives, smelt, and yellow perch. Young (O group) alewives were first taken in shallow water (2-7 1/2 fathoms) in September and were extremely plentiful in October; small catches were made in deep water (8-25 fathoms) in October. Older alewives were most plentiful in the shallow water of the inner part of the Bay in August. Few were taken at any depth in other months.

Young-of-the-year smelt were first taken in July and were subsequently plentiful in shallow water; good catches were made in deep water in October. Older smelt were abundant in shallow areas in June and October but scarce in other months; good deep-water catches were taken in August.

The only substantial catch of O-group yellow perch was made in the shallow water of the inner part of the Bay in October. Larger perch were caught in highly variable, but usually substantial numbers in shallow water in all months of fishing; moderate numbers were caught in deep water in August, and the largest catches at any time or depth were in deep water in October.

DISTRIBUTION AND SEASONAL MOVEMENTS OF SAGINAW BAY FISHES

INTRODUCTION

The research vessel Cisco, Bureau of Commercial Fisheries, was used for experimental fishing in Saginaw Bay and the adjacent waters of southern Lake Huron in the summer and fall (June 3-November 27) of 1956. Most fish were taken by trawls and gill nets from depths greater than 10 feet, but collections were supplemented by samples from inshore seining at depths less than 3 feet. Distribution records previous to this investigation were very scanty for areas other than the shallow, inshore water of the Bay.

The collections of many species were too scattered and infrequent to allow positive statements on distribution and seasonal movement. Collections of other species were sufficient, however, to provide general information on local differences and seasonal changes of abundance.

This paper is confined to fish caught in Saginaw Bay, defined here as the water southwestward of a line extending from Au Sable Point to Point aux Barques (fig. 1). Another line from Point Lookout (northwest shore) through Charity Island to Oak Point (southeast shore) was chosen to divide the "inner bay" from "outer bay." The outer bay was further divided into shallow (out to 7 1/2 fathoms) and deep (8-25 fathoms) areas. Conditions in the inner bay and shallow areas of the outer bay are similar to those commonly found in inland lakes, whereas conditions in the deeper outer bay approach those of the open waters of Lake Huron.

Common names of fish are used throughout the text except for several species of the genus Coregonus for which only specific names are used. Both common and scientific names are listed for each species in tables 2 and 3.

COLLECTION OF MATERIALS AND DATA

Trawls, seines, and nylon gill nets (both shoal gill nets and bull nets) were used for collecting fish. Station locations, except for seining, were plotted with the aid of radar, and water depth was recorded by an echo-sounder. 1/

1/ See Moffett (1954) for description of Cisco equipment.

Most trawling was carried out in daylight, but some night trawling was conducted each cruise. The trawling speed of the Cisco was approximately 3 m. p. h. It varied slightly, depending upon the influence of winds and currents. Trawls usually were towed for 10 minutes. Some tows were cut short because of obstacles, and a few longer tows were made to determine the variation of catch with time; the total time range was 3 to 30 minutes. All trawling data recorded in this paper were from tows made on the bottom along the contour. Occasionally the trawl did not operate properly or was snagged and torn. Data from these tows and from midwater tows were not included in the quantitative records. Of the three types of trawls fished, the most successful and frequently used was trawl No. 2 (table 1).

Experimental nylon gill nets were set on the bottom at various depths and obliquely from the surface to the bottom. The gangs of gill nets set on the bottom included 250 feet each of 2 1/4-, 2 1/2-, 2 3/4-, 3-, and 4-inch mesh, extension measure; these nets were 6 feet deep. During Cruise 9 (November 18-21), 100 feet of 2-inch mesh and 50 feet each of 1- and 1 1/2-inch mesh were added to the original gang. At Station 11 separate gangs of 2 1/2- and 3 1/2-inch mesh were set obliquely at 13 fathoms (two 250-foot nets of each mesh). Nylon bull nets--2 1/2-inch mesh, 120 meshes deep, and 300 feet long--were set on the bottom (November 19) and suspended 1 fathom below the surface (June 26).

Seining was conducted at 10 inshore stations (fig. 1). All seine hauls were made during daylight with a 1/2-inch-mesh seine (without bag) 30 feet long and 3 feet deep. The hauls were from 50 to 300 feet per drag in water up to 3 feet deep.

Most fish were identified in the field. The identity of questionable specimens was verified later in the laboratory. At least one representative from each species is preserved in the Bureau's collection.

Distribution records in this survey are based upon 10 trawling, 6 gill netting, and 10 seining stations (fig. 1). Five locations were utilized as both trawling and gill netting stations. Most trawling and gill netting stations were visited periodically from June through November (see appendix table 1). All

Figure 1. --Map of Saginaw Bay showing locations and type of fishing at each fishing station. Dotted lines show the lakeward limit of the Bay and the division between the inner and outer bay. Contours are in fathoms. Gill net stations are represented by squares, trawl stations by circles, and seine stations by triangles. See appendix table 1 for dates the various gears were fished.

Table 1. --Description of trawls used in Saginaw Bay

Trawl number	Times towed 1/	Type 2/	Sweep (feet)	Total length (feet)	Mesh size (Extension measure, inches)			
					Wings	Body		Cod end
						Fore	Aft	
1	6	MS	34	31-35	2	2	2	1
2	31	MS	35	31-35	1 1/2 - 2 1/2	1 1/2 - 2	1	1/2
3	6	EC	51	36	3 1/2	3 1/2	3 1/2	1/2

1/ Does not include midwater tows.
2/ MS - modified shrimp trawl (body and cod end longer); EC - 3/4-size No. 35 east-coast whiting trawl.

seining was conducted in August with the exception of one haul in September. Eight of the seining stations were on the northwesterly side and two were on the southeasterly side of Saginaw Bay.

GEOGRAPHICAL DISTRIBUTION

Forty-seven species of fish were recorded in the 1956 study. The geographic distribution of 30 species taken from Saginaw Bay in trawls and gill nets and 27 species caught by inshore seining is listed by location in table 2. All species in the table had been previously recorded for the Bay, but the locality records for several were increased greatly. The following 17 species were caught only by seining in shallow inshore waters:

Stoneroller	Brown bullhead
Longnose dace	Tadpole madtom
Common shiner	Central mudminnow
Sand shiner	Banded killifish
Spotfin shiner	Blackside darter
Fathead minnow	Iowa darter
Bluntnose minnow	Rock bass
Black bullhead	Smallmouth bass

Largemouth bass

Six species, including five that were captured at other than seining stations, were taken at 50 percent or more of the seining localities: emerald shiner, spottail shiner, yellow perch, Johnny darter, largemouth bass, and pumpkinseed. Other species occasionally taken by seining included alewife, white sucker, carp, and logperch. Nearly all alewife, carp, yellow perch, pumpkinseed, smallmouth bass, largemouth bass, and black crappie caught by seining were young-of-the-year or yearlings.

The four most widely distributed species--alewife, smelt, white sucker, and yellow perch--were found at more than 90 percent of the gill net and trawling stations, and no doubt inhabit most areas in the bay at some time during the year. Five species (carp, emerald shiner, logperch, spottail shiner, and trout-perch) were taken at more than 50 percent but less than 75 percent of the stations. Lake herring and walleye were caught at more than 30 percent but less than 50 percent of the stations. Six species--channel catfish, Johnny darter, mottled sculpin, pumpkinseed, sauger, and white bass--were caught at more than 10 percent but less than 30 percent of the stations. The following 12 species were collected at less than 10 percent of the stations: C. alpenae, black crappie, brown trout, burbot, gizzard shad, C. hoyi, longnose sucker, northern pike, rainbow trout, silver lamprey, stonecat, and yellow bullhead.

All centrarchids, the silver lamprey, longnose gar, stoneroller, fathead minnow, bluntnose minnow, black bullhead, brown bullhead, tadpole madtom, mudminnow, northern pike, blackside darter, and Iowa darter were found only in the inner bay. Fishes captured only in the outer bay include: gizzard shad, rainbow trout, brown trout, longnose sucker, longnose dace, sand shiner, spotfin shiner, and burbot.

Additional distribution records of the fish fauna of Saginaw Bay were obtained from the Division of Fishes, Museum of Zoology, University of Michigan. This list (table 3) includes 24 species not collected

in the 1956 Cisco survey and provides additional records on general geographic distribution (occurrence in inner bay and outer bay) for 13 other species. Three species, not listed in either table 2 or table 3, are also known to inhabit, or to have inhabited, the bay. Past commercial catch records show that lake trout (Salvelinus namaycush) and round whitefish (Prosopium cylindraceum) were both taken in Saginaw Bay. Specimens of the sea lamprey (Petromyzon marinus), a predator of considerable consequence, are present in the Bureau's collection from earlier studies. These various distribution records from the Cisco survey, past Bureau collections, the Museum of Zoology, and commercial catch statistics contribute a total of 74 known species for Saginaw Bay.

SEASONAL MOVEMENTS

Experimental trawling, supplemented by gill net fishing, has furnished a few clues to the seasonal movements of the more abundant species of Saginaw Bay. Although samples are scattered and infrequent for some areas and lacking for most of the year in others, certain trends are evident. The most useful information comes from the trawling records.

Five trawling stations were located in the outer bay and five in the inner bay (fig. 1). In order to minimize gear bias, calculations of relative abundance for the three areas--inner bay and shallow and deep waters of the outer bay--were based entirely on fish taken in trawl No. 2 (table 1) in each month except June (see footnote to table 4). All catches are given in terms of the number of each species taken in 10 minutes, the usual trawling time; the actual catches of tows shorter or longer than 10 minutes were adjusted accordingly.

Nylon gill nets set on the bottom at various locations were helpful in determining distribution and species composition of the larger fish in the population and provided samples in certain areas where the bottom is not suitable for trawling. Many of the larger fish that elude trawls are vulnerable to gill nets; thus the combination of both fishing methods in some areas offered a more representative sample than could be taken by either gear alone. Unfortunately, this combination of fishing methods on the same date and location was not possible in most areas (appendix table 1). The contribution of additional data from gill net catches was most valuable for adult alewives, chubs, lake herring, walleyes, and white suckers.

Alewives

The older alewives were numerous only during spawning which took place in the inner bay in late July (gill net records) and early August (308 per trawl tow; table 4). Adults were captured only infrequently after this time in all areas.

Approximately 97 percent of the alewives taken by trawling during the season were young-of-the-year. They were the most abundant species in the inner bay during October (2,549 per tow) and shallow area (2-7 1/2 fathoms) of the outer bay in September and October (328 and 2,847 per tow, respectively). The alewife (both O group and older) was scarce in the deeper portions (8-25 fathoms) of the outer bay in August (6 per tow) and October (103 per tow).

Smelt

The older smelt were dominant in the shallow inner bay during July (955 per tow), but were not abundant in the same area in August and October (42 and 17 per tow). Most of them apparently moved to the cooler, deeper water of the outer bay (and the open lake) when temperatures of inshore areas reached 15°-17° C. (59°-63° F.), for the smelt was the most numerous species in this area in August (471 per tow). October trawling revealed the return of older smelt to the shallow portion of the outer bay (937 per tow) but did not take them in the deeper area.

The O-group smelt were numerous from July to October in all areas of the bay except the deeper part of outer bay in August. Temperature change appears to be decidedly less influential in the distribution of young smelt than for the adults.

Yellow Perch

Yellow perch of age-group I and older were caught in all areas throughout the season. They were most abundant in August in the inner bay (962 per tow) and in the deep outer bay in October (1,017 per tow). They were least plentiful in the shallow outer bay in October (17 per tow).

Young-of-the-year yellow perch were taken only in the inner bay. They inhabited very shallow inshore areas during the summer (seining records) and were numerous in the trawl catches in the inner bay in October (350 per tow).

Table 2. --Geographic distribution of 47 species of fish taken by gill nets, trawls, and seines from Saginaw Bay, 1956

[See fig. 1 for location of stations. A plus sign indicates that the species was taken at that station]

Scientific name	Common name	Area and station numbers																			
		Inner Bay													Outer Bay							
		1	2	3	4	5	6	15	16	17	18	19	20	21	7	8	9	10	11	12	13	14
Petromyzontidae																						
Ichthyomyzon unicuspis	Silver lamprey	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lepisosteidae																						
Lepisosteus osseus	Longnose gar	-	-	-	-	+	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-
Clupeidae																						
Dorosoma cepedianum	Gizzard shad	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-
Alosa pseudoharengus	Alewife	-	+	+	+	+	+	+	-	-	+	-	-	-	+	+	+	+	+	-	-	-
Salmonidae																						
Salmo gairdneri	Rainbow trout	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
Salmo trutta	Brown trout	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
Coregonus alpenae	Longjaw cisco	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
Coregonus artedii	Lake herring	+	-	-	-	+	-	-	-	-	-	-	-	-	+	-	-	-	+	-	-	-
Coregonus hoyi	Bloater	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
Osmeridae																						
Osmerus mordax	American smelt	+	+	+	+	+	+	-	-	-	-	-	-	-	+	+	+	+	+	-	-	-
Catostomidae																						
Catostomus commersoni	White sucker	+	+	+	-	+	+	+	-	-	-	-	+	-	+	+	+	+	+	-	-	-
Catostomus catostomus	Longnose sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
Cyprinidae																						
Campostoma anomalum	Stoneroller	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
Cyprinus carpio	Carp	+	+	+	-	+	-	+	+	+	-	-	-	-	+	+	+	+	-	-	-	-
Rhinichthys cataractae	Longnose dace	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
Notropis atherinoides	Emerald shiner	-	+	+	+	+	+	+	-	-	+	+	+	-	+	+	-	+	-	+	-	+

(Continued)

Table 2. --Continued

Scientific name	Common name	Area and station numbers																			
		Inner Bay													Outer Bay						
		1	2	3	4	5	6	15	16	17	18	19	20	21	7	8	9	10	11	12	13	14
Cyprinidae (Cont'd)																						
Notropis cornutus	Common shiner	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
Notropis stramineus	Sand shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
Notropis hudsonius	Spottail shiner	-	+	+	+	+	+	+	-	+	+	+	+	-	-	+	-	+	-	+	+	-
Notropis spilopterus	Spotfin shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
Pimephales promelas	Fathead minnow	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pimephales notatus	Bluntnose minnow	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
Ictaluridae																						
Ictalurus punctatus	Channel catfish	-	-	-	-	+	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-
Ictalurus melas	Black bullhead	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
Ictalurus nebulosus	Brown bullhead	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
Ictalurus natalis	Yellow bullhead	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-
Noturus flavus	Stonecat	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Noturus gyrinus	Tadpole madtom	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	-
Umbridae																						
Umbra limi	Mudminnow	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
Esocidae																						
Esox lucius	Northern pike	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyprinodontidae																						
Fundulus diaphanus	Banded killifish	-	-	-	-	-	-	-	+	-	+	-	-	+	-	-	-	-	-	-	+	-
Gadidae																						
Lota lota	Burbot	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-
Percopsidae																						
Percopsis omiscomaycus	Trout-perch	+	-	+	+	+	+	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-

(Continued)

Table 2. --Continued

Scientific name	Common name	Area and station numbers																			
		Inner Bay													Outer Bay						
		1	2	3	4	5	6	15	16	17	18	19	20	21	7	8	9	10	11	12	13	14
Serranidae																						
Roccus chrysops	White bass	+	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-
Percidae																						
Perca flavescens	Yellow perch	+	+	+	+	+	+	+	+	-	+	-	+	-	+	+	+	+	+	-	+	+
Stizostedion canadense	Sauger	+	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-
Stizostedion v. vitreum	Walleye	-	-	-	-	+	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-
Etheostoma nigrum	Johnny darter	-	-	-	+	-	+	+	-	+	-	-	-	+	+	-	-	-	-	-	-	+
Etheostoma exile	Iowa darter	-	-	-	-	-	-	-	+	-	+	-	-	+	-	-	-	-	-	-	-	-
Percina maculata	Blackside darter	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-
Percina caprodes	Logperch	-	+	-	-	+	+	+	-	-	-	-	-	-	+	+	-	-	+	-	-	-
Centrarchidae																						
Ambloplites rupestris	Rock bass	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
Lepomis gibbosus	Pumpkinseed	-	+	-	-	-	+	+	+	+	-	-	+	+	-	-	-	-	-	-	-	-
Micropterus dolomieui	Smallmouth bass	-	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-
Micropterus salmoides	Largemouth bass	-	-	-	-	-	-	+	+	+	+	-	-	+	-	-	-	-	-	-	-	-
Pomoxis nigromaculatus	Black crappie	-	+	-	-	-	-	+	-	-	+	-	+	-	-	-	-	-	-	-	-	-
Cottidae																						
Cottus bairdi	Mottled sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	-	-	-

Table 3. --Additional distribution records of fish inhabiting Saginaw Bay from the collection of the Division of Fishes, Museum of Zoology, University of Michigan

[A plus sign indicates that the species was collected in that area only; a double plus sign shows the species was collected in an area other than that recorded by the Cisco (table 2); a triple plus sign indicates that the species is represented in the museum and was also recorded by the Cisco for that area; absence of a symbol indicates no specimens recorded from that area]

Scientific name	Common name	Area	
		Inner Bay	Outer Bay
Acipenseridae			
Acipenser fulvescens	Lake sturgeon	+	-
Amiidae			
Amia calva	Bowfin	+	-
Salmonidae			
Salmo gairdneri	Rainbow trout	++	-
Coregonus clupeaformis	Lake whitefish	+	+
Coregonus alpenae	Longjaw cisco	++	-
Coregonus hoyi	Bloater	++	-
Catostomidae			
Carpiodes cyprinus	Quillback	+	-
Catostomus catostomus	Longnose sucker	++	-
Erimyzon sucetta	Lake chubsucker	+	-
Hypentelium nigricans	Northern hog sucker	+	-
Ictiobus niger	Black buffalo	+	-
Moxostoma anisurum	Silver redhorse	+	-
Moxostoma macrolepidotum	Northern redhorse	+	-
Moxostoma valenciennesi	Greater redhorse	+	-
Cyprinidae			
Hybopsis plumbea	Lake chub	+	-
Hybognathus hankinsoni	Brassy minnow	+	-
Notemigonus crysoleucas	Golden shiner	+	+
Notropis cornutus	Common shiner	+++	++
Notropis atramineus	Sand shiner	++	+++
Notropis heterolepis	Blacknose shiner	+	-
Notropis rubellus	Rosyface shiner	+	-
Notropis spilopterus	Spotfin shiner	++	+++
Notropis volucellus	Mimic shiner	+	-
Rhinichthys cataractae	Longnose dace	++	+++
Ictaluridae			
Ictalurus natalis	Yellow bullhead	++	-

(Continued)

Table 3. --Continued

Scientific name	Common name	Area	
		Inner Bay	Outer Bay
Percidae			
Percina copelandi	Channel darter	+	+
Percina shumardi	River darter	+	-
Centrarchidae			
Ambloplites rupestris	Rock bass	+++	++
Micropterus dolomieui	Smallmouth bass	+++	++
Micropterus salmoides	Largemouth bass	+++	++
Lepomis gibbosus	Pumpkinseed	+++	++
Lepomis macrochirus	Bluegill	+	-
Pomoxis annularis	White crappie	+	-
Sciaenidae			
Aplodinotus grunniens	Freshwater drum	+	-
Cottidae			
Cottus ricei	Spoonhead sculpin	-	+
Gasterosteidae			
Eucalia inconstans	Brook stickleback	+	+
Pungitius pungitius	Ninespine stickleback	+	-

Table 4. --Average catch (per 10-minute tow) of alewives, smelt, and yellow perch taken by trawling in Saginaw Bay, 1956

Item	Inner Bay (2 - 7 1/2 fathoms)				Outer Bay					
					Shallow (2 - 7 1/2 fathoms)				Deep (8 fathoms)	
	June 1/	July	August	October	June 1/	August	September	October	August	October
Number of tows	1	5	2	6	1	4	3	3	4	5
Average depth (fathoms)	7.0	4.4	3.5	3.4	6.5	3.5	7.0	5.7	17.6	10.2
Alewife										
O-group	0	0	0	2,549	0	0	328	2,847	0	102
I-group and older	0	17	308	0	0	1	0	1	6	1
Smelt										
O-group	0	107	792	204	0	158	178	119	0	372
I-group and older	1	955	42	17	20	0	9	937	471	0
Yellow perch										
O-group	0	4	0	350	0	0	0	0	0	0
I-group and older	282	324	962	266	623	132	60	17	113	1,017

1/ June samples may be compared with each other, but are not comparable to samples from other months.

Only 0.1 percent (inner bay) to 1.2 percent (deep outer bay) of all yellow perch taken by trawling had attained the minimum legal length required in the commercial fishery (8 1/2 inches). El-Zarka (1959) reported a seasonal change in the percentage of legal-sized perch taken in trap nets near Bay Port in the inner bay in 1955: "On April 18 this percentage [of legal fish] was 35.6, but fishermen did not benefit from the relatively high value because fishing for perch is not allowed at that time (closed season, April 15-May 10). The proportion of legal-sized perch subsequently fell to barely 2 percent on May 18 and June 7 and less than 2 percent on June 22. In the fall (October 9) the percentage increased again to 20.0." El-Zarka attributed this October increase to the presence of a large percentage of females, which grow faster than males.

Other Species

Chubs (Coregonus spp.) caught in Saginaw Bay were taken almost exclusively by gill nets in the deep outer bay. Due to the limited numbers captured, details on the findings are not offered here.

Lake herring were not concentrated until the spawning run in mid-November. A gill net lifted from the bottom north of Sand Point (Station 5) on November 19 caught 1,790 lake herring weighing 958 pounds. At the same time and location, a single bull net set on the bottom contained 1,632 weighing 804 pounds. Some of the lake herring were ripe, but none were spent. The same type of gill nets (bull net not fished) lifted the following day off Fish Point (Station 1) caught only 30 lake herring.

No concentrations of walleyes were located. Fifty-eight walleyes were taken during the season from five outer-bay stations; 19 of them were tagged (Petersen tags) and released. Two tags have been recovered. One was from a fish released near Charity Island on August 7 and recovered a few miles away on September 15 by a commercial fisherman. The second tag was recovered March 31, 1957, near Port Clinton, Ohio, in western Lake Erie from a walleye released November 2, 1956, at Station 9.

White suckers inhabited shallow water (7 1/2 fathoms and less) during the period of this investigation with one exception on August 29, when 36 were taken at 13 fathoms (Station 11) in gill nets.

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Appendix table 1. --Dates, locations, and depths of experimental fishing in Saginaw Bay, 1956
[Table includes only the lifts pertinent to this report]

Assigned station number	Cisco station number	Depth (fathoms)	Trawl			Gill nets			Seine
			No. 1	No. 2	No. 3	Set on bottom	Set obliquely	Bull net	
1	116	3-4	...	...	...	Nov. 4	...	...	...
		3-3.5	...	...	...	Nov. 19	...	...	...
2	115	2-4.5	...	Oct. 14	...	...	...	...	...
3	111	2.5,4-5	...	Aug. 11	...	...	...	...	...
4	104	4,6.5	June 30	...	...	...	...	...	...
5	109	3-3.5	...	July 19	...	...	...	...	...
		3.5	...	...	...	July 20	...	...	...
		3.5-4	...	...	...	Nov. 1	...	...	...
		3-4	...	...	...	Nov. 19	...	...	...
		1/ 4	...	...	...	...	...	Nov. 19	...
6	110	3,5,7.5	...	July 21	...	...	...	...	...
7	108	4	...	July 19	...	...	...	...	...
		3.5	...	Aug. 7	...	...	...	...	...
		3.5-4,11	...	Oct. 9	...	...	...	...	...
		3.8-4	...	Nov. 2	...	...	...	...	...
		3.5-3.8	...	...	...	Nov. 15	...	...	...
8	103	6-8	June 28	...	...	...	...	...	...
		10-10.5	...	Aug. 7	...	...	...	...	...
		6.5-8	...	Sept. 19	...	...	...	...	...
		6.5-7,10,11	...	Oct. 4	...	...	...	...	...
		7,9-10	...	Oct. 31	...	...	...	...	...
9	106	4-4.5	...	...	...	Aug. 7	...	...	...
		3	...	...	...	Aug. 17	...	...	...
		4.5-5	...	...	...	Oct. 10	...	...	...
10	105	3	...	...	...	July 19	...	...	...
		2.5,5,10.5	July 17	...	...	...	...	...	...
		3.5-4	...	...	July 18	...	...	...	...
11	101	0-13	...	...	...	...	June 9	...	...
		0-13	...	...	...	...	June 26	...	...
		2/ ...	...	...	...	...	...	June 26	...
		0-13	...	...	...	...	July 16	...	...
		0-13	...	...	...	...	Aug. 16	...	...

(Continued

Appendix table 1. --Continued

Assigned station number	Cisco station number	Depth (fathoms)	Trawl			Gill nets			Seine
			No. 1	No. 2	No. 3	Set on bottom	Set obliquely	Bull net	
		15.5-16	...	Aug. 8	...	...	...	...	...
		20, 24-25	...	Aug. 8	...	...	...	...	...
		0-13	...	...	...	...	Aug. 29	...	...
		0-13	...	...	...	...	Oct. 10	...	...
		0-13	...	...	...	...	Nov. 1	...	...
12	S-a	0.0-4	...	...	...	...	...	...	Aug. 1
13	S-b	0-0.5	...	...	...	...	...	...	Aug. 1
14	S-c	0-0.5	...	...	...	...	...	...	Aug. 1
15	S-d	0-0.4	...	...	...	...	...	...	Aug. 1
16	S-e	0-0.2	...	...	...	...	...	...	Aug. 1
		0-0.2	...	...	...	...	...	...	Sept. 20
17	S-f	0-0.2	...	...	...	...	...	...	Aug. 1
18	S-g	0-0.4	...	...	...	...	...	...	Aug. 21
19	S-h	0-0.2	...	...	...	...	...	...	Aug. 21
20	S-i	0-0.4	...	...	...	...	...	...	Aug. 23
21	S-j	0-0.5	...	...	...	...	...	...	Aug. 23

1/ Set on the bottom.

2/ Suspended at 1 fathom in water 13 feet deep.

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